



Refuge sign
USFWS Photo

II. Refuge Description

INTRODUCTION

Bayou Cocodrie National Wildlife Refuge is located in east central Louisiana, 13 miles west of the Mississippi River and Natchez, Concordia Parish, Mississippi (Figure 5). The city of Ferriday, located about 4 miles northeast of the refuge, is the nearest community. Although the refuge was established in 1990, to date, only 13,168 acres have been acquired within the 22,269-acre acquisition boundary (Figure 6). In addition to this acquisition boundary, areas outside the boundary are being studied for inclusion in the refuge system and/or partnership planning efforts. It also includes portions of the Lower Mississippi Valley watershed that affect the planning study area (Figure 7).

The potential wildlife habitat values of old growth bottomland hardwoods and adjacent forests provided the impetus to purchase the property from its original owners. In 1988, The Nature Conservancy purchased 11,230 acres from the Fisher Lumber Company, a subsidiary of General Motors, for resale to the Service.

Management efforts since 1990 have emphasized acquiring land, securing staff to operate the new facility, and initiating conservation programs that benefit resident wildlife species. However, Service acquisition of key properties, such as inholdings and bottomland hardwood forest habitats, may not be realized within the 15 year planning period due to budget constraints and landowner preferences. The 13,168-acre refuge boundary has a significant edge which contributes to predation of nesting forest birds. Edge effect is the tendency of a transitional zone between communities to contain a greater variety of species and more dense populations of species than any surrounding community. Such is the case between wildlife communities that occupy dense bottomland hardwood forests and wildlife found in open, cultivated agricultural lands.

Conservation management projects include:

- Conducting comprehensive assessments of existing fish and wildlife resources;
- Recruiting and training staff and improving existing facilities;
- Defining refuge objectives that will contribute to maintaining biological diversity within the Lower Mississippi Valley;
- Managing habitats to reduce threats and problems (i.e., forest fragmentation, loss of old growth forests) associated with species of concern;
- Assisting in black bear recovery efforts; and
- Defining research within the old growth area and involving partners to accomplish the research.

Figure 5. Refuge location



Figure 6. Approved aquisition target areas

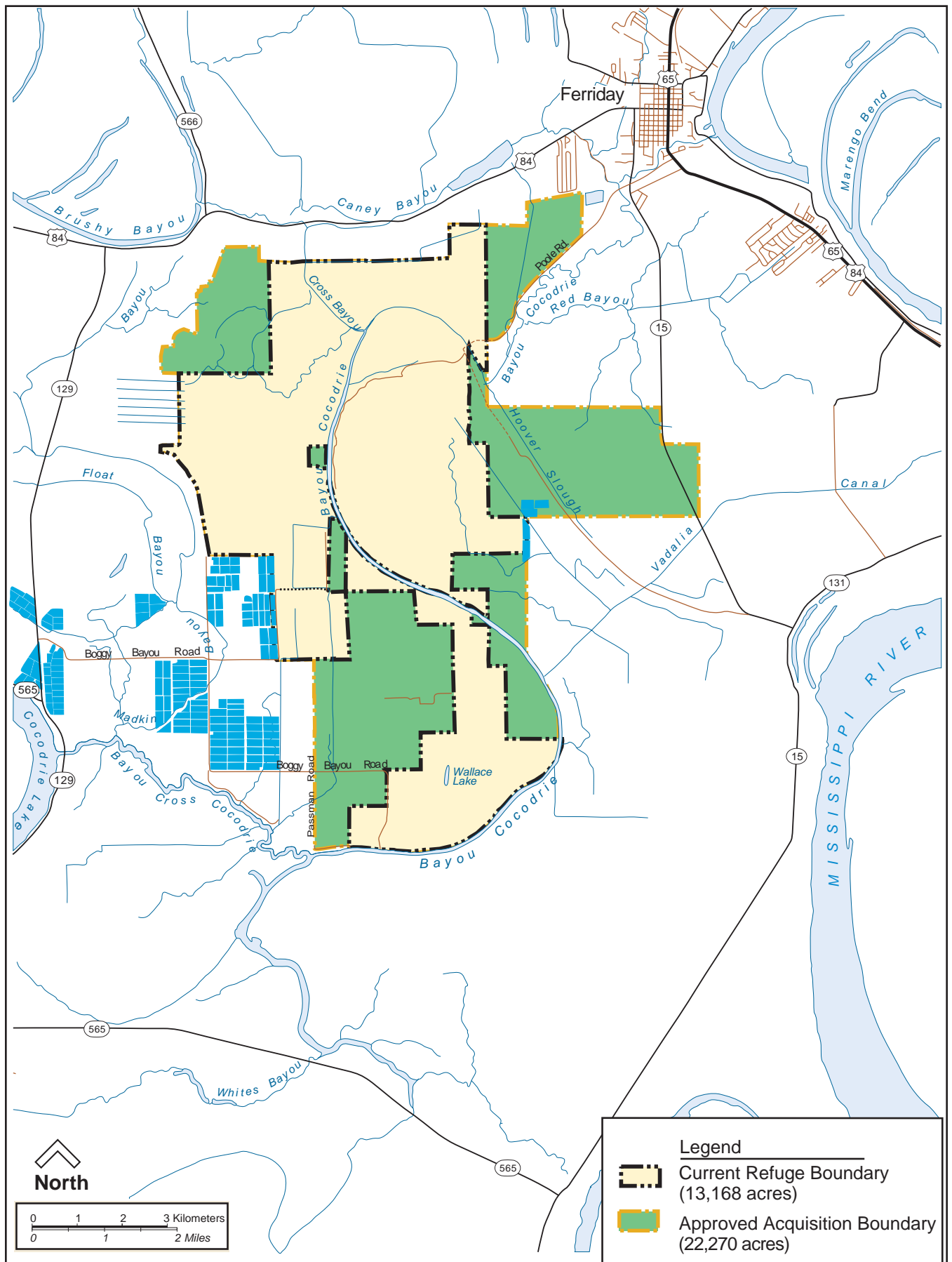
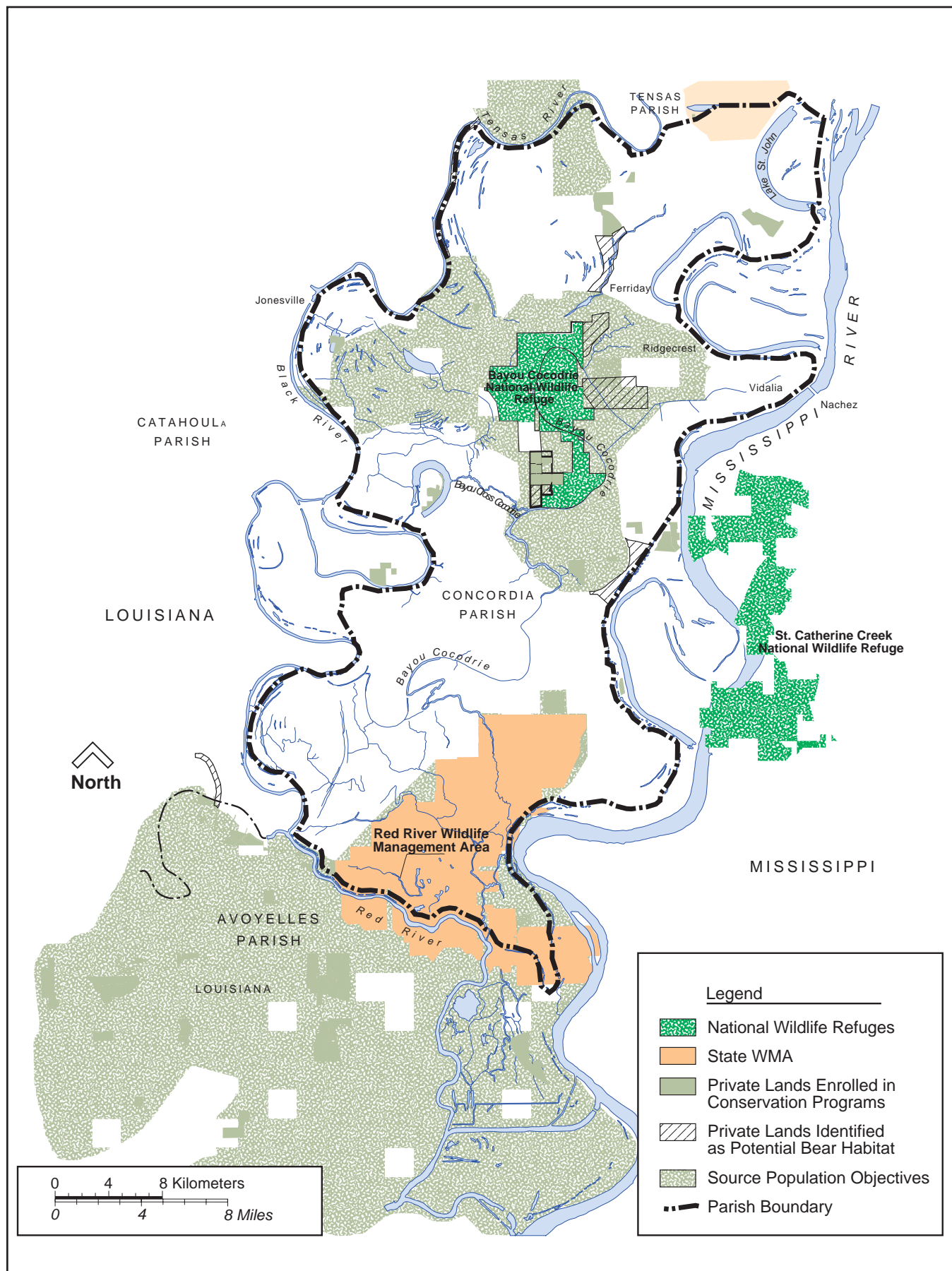


Figure 7. Planning study area



PURPOSE

Congress authorized the establishment of Bayou Cocodrie National Wildlife Refuge on November 16, 1990, through Public Law 101 593 (Section 108, House Report 3338), to protect some of the last remaining, least disturbed bottomland hardwoods in the Lower Mississippi Valley. Congress stated the refuge purpose as follows:

"The Bayou Cocodrie National Wildlife Refuge is established and shall be managed for the purposes of (1) conservation and enhancement of wetlands; (2) general wildlife management as a unit of the National Wildlife Refuge System, including management of migratory birds; and (3) fish and wildlife-oriented recreational activities."

In establishing the refuge, Congress recognized the significance of this area in its findings:

"The Bayou Cocodrie area is a bottomland hardwood swamp which borders (supports or harbors) more than one hundred and fifty species of birds and many other types of wildlife, including several species threatened with extinction, such as the Louisiana population of black bears. The Bayou Cocodrie area includes some of the least disturbed bottomland hardwood forests in the southeast and significantly contributes to the biological diversity in the region."

In managing the refuge, the Secretary of the Interior shall manage:

"...an amount of refuge woodlands as a contiguous forest sufficient to benefit the species of passerine birds that occupy this type of habitat. The Secretary shall give special consideration to accomplishing this objective through the use of current authority, including his authority to establish Research Natural Areas within the Refuge."

Expanding on the primary purpose, objectives were defined in the June 1992 Environmental Assessment and Land Protection Plan prepared by the Service. The management objectives include:

- Providing wintering habitat for migratory waterfowl;
- Establishing habitat for a natural diversity of wildlife;
- Providing habitat for non-game migratory birds (neotropicals);
- Establishing a Research Natural Area; and
- Providing opportunities for environmental education, research, interpretation, and other wildlife-dependent recreation.

BIOLOGICAL ENVIRONMENT

Fish, Wildlife, and Plant Populations

The refuge serves as a critical repository of gene pools, species, and communities that must contribute to the overall health of the Lower Mississippi Valley Ecosystem. Named after the native alligator

**Comprehensive
Conservation Plan**

Refuge Description



Yellow-throated warbler
USFWS Photo

(crocodile) and the bayou that runs through it, the refuge provides an important ecological niche for fish, wildlife, and plant species. The Service manages refuge resources and, where possible, coordinates with neighboring land managers and agencies to conserve biological diversity. The high quality forests, long growing season, abundant rainfall, and geographical proximity to the Mississippi River provide habitat for a diversity of resident species, including migratory songbirds and black bear. The refuge is home to a wide variety of amphibians, reptiles, mammals, and birds and is well known locally for its wildlife habitat. Songbirds, white tailed deer, waterfowl, shorebirds, raptors, reptiles, amphibians, woodcock, furbearers, and other mammals utilize this area. A list of wildlife species known or predicted to inhabit the refuge is included in Appendix D.

A thorough documentation of the population status of wildlife other than neotropical songbirds has not been conducted. Excellent documentation of neotropical bird use of portions of the refuge has been accomplished under Service sponsorship by the Louisiana State University Avian Laboratory.

Threatened Species and Species of Management Concern

Infrequently, the refuge staff observes footprints of the transient Louisiana black bear, which is listed as threatened under the Endangered Species Act. The threatened bald eagle has been observed on the refuge. Initial and unpublished studies have indicated that the refuge's old growth trees are important roosting sites for the Rafinesque's big-eared bat, a species of management concern (unpub. reports, Cochran and Fish and Wildlife Service 1999). The Florida panther and the red wolf were former residents of the area, but none have been documented in the last 40 years.

The refuge location and habitat features are significant for the future conservation of the Louisiana black bear. Restoration efforts proposed by the Black Bear Conservation Committee include proposed bear management units that would protect lands outside the current refuge acquisition boundary. The Service, the Louisiana Department of Wildlife and Fisheries, and members of the Black Bear committee are planning to eventually move females onto the refuge, and other public lands near the refuge, in an effort to reestablish breeding populations. The committee also has identified private lands that could be used as corridors between breeding bear populations. A combination of protected and managed public and private lands would provide the necessary forested blocks and corridors for bears to move about with minimal disturbance. The Natural Resources Conservation Service plays a major role in black bear recovery efforts by implementing land protection programs that provide an economic incentive for farmers to restore farmlands and place them in conservation easements.

Avian Species

Avian species are extremely important wildlife resources identified on the refuge with more than 186 species recorded within the refuge

border (unpub. data, Ouchley). The bottomland hardwood forests serve as important habitat for breeding birds and migratory birds in the spring and fall. Surveys and studies indicate that this refuge may contain the most diverse assemblage of migratory bird species remaining in the Lower Mississippi Valley.

For migratory forest breeding songbirds and shorebirds, the ecological and biological significance is transcontinental, providing breeding and migration habitat for gulf migrants returning from their wintering grounds in Central and South America. Songbird studies have been conducted in the Brooks Brake Unit, which contains a 750-acre old growth forest stand. Additional surveys and monitoring would confirm breeding songbird survey information, nest success, and other key measurements. Such species as warblers, vireos, tanagers, flycatchers, and indigo buntings are common residents.

The refuge and the Lower Mississippi Valley serve as the primary wintering ground for mid-continent waterfowl populations breeding in the prairies and parklands of Canada and the United States. Excellent historic conditions, typical of refuge habitats, once supported migratory waterfowl. Management efforts to improve wintering waterfowl habitat on refuge lands are underway and will increase as additional lands are purchased. Typical winter residents include mallards, teal, and wood ducks. Waterfowl species known to nest in this area include wood ducks and hooded mergansers. Restoration and management of wetlands on the refuge would create additional resources for dabbling ducks.

Waterfowl population objectives are tied to supporting the North American Waterfowl Management Plan. A 440-acre moist-soil impoundment is managed adjacent to a recently reforested area and cropland. The refuge impoundments, in conjunction with naturally flooded forest habitat, will eventually support about 480,000 duck-use-days. The refuge population objective will average between 5,000-10,000 ducks for 110 days (unpub. report, Bayou Cocodrie National Wildlife Refuge 1998). This population objective is supported by the moist-soil unit, flooded sloughs, Wallace Lake and Little Wallace Lake, as well as brakes subject to flooding. Managers focus work on the moist-soil units, selected sloughs in the Brooks Brake Unit, and construction of wood duck boxes. The only breeders utilizing the bottomland hardwood forests are wood ducks and hooded mergansers.

Wading birds are abundant in the small lakes and numerous sloughs. The backwater bays, sloughs, and depressions provide habitat for shorebirds such as yellowlegs, sandpipers, plovers, gulls, and terns that can be found using wetland mudflats and bayous during their spring and fall migrations. Herons and egrets are plentiful.

Mammals

Mammals are numerous and observed throughout the refuge. No comprehensive list of mammalian species exists for the refuge, although it is known which mammals occur in this area (St. Amant 1951 and Lowery 1981). The refuge area contains seven orders of

mammals including pouched mammals (opossums); insect-eaters (shrews and moles); bats; flesh-eaters (long-tailed weasel); gnawing mammals (southern flying squirrel); rabbits; and even-toed hoofed mammals (white-tailed deer).

The bottomland hardwood communities are very productive for a wide array of wildlife species, including game animals. Game species include white-tailed deer, grey and fox squirrels, and swamp and cotton-tailed rabbits. Furbearers include beaver, nutria, otter, striped skunk, coyote, grey and red fox, mink, and bobcat. The deer hunt program is designed to maintain herd levels at or slightly below carrying capacity. Population levels have improved dramatically since Service acquisition, as have herd health indicators. Average body weights are improving and mature bucks may weigh in excess of 250 pounds live weight. Future deer populations will be a reflection of both forest management and deer harvest.

Raccoon populations are monitored to ensure compatible levels with other species. Negative impacts from excessive population numbers include depredation on turkey, neotropical birds, and wading bird nests.

Feral hogs compete with resident wildlife for food and can cause crop damage to neighboring farms. Hunting and removal programs should bring these animals under control.

Reptiles and Amphibians

Although frequently observed, much is still unknown about reptile and amphibian population levels on the refuge. At least thirty species of reptiles and amphibians and a variety of native and non-native aquatic species are known to occur on the refuge. The diverse group of amphibians including salamanders, toads, and frogs is well adapted to the aquatic and terrestrial environments, and moisture is typically important for the group's survival. Reptiles including turtles, alligators, lizards, skinks, and snakes are common.

Aquatic Species

These species are most commonly observed along the main stem of the Bayou Cocodrie. Although limited, the refuge does provide an important fishery resource for local fishermen. Most of the aquatic habitat consists of beaver ponds, oxbow lakes such as Wallace and Little Wallace, and Cross Bayou streams that support commercial fishing for catfish, buffalo, alligator gar, and freshwater drum. Sport fishing populations of crappie, bass, and bream are also found in these lakes, although the populations are low due to periodic water quality problems, particularly high turbidity. Access to the lakes is very limited.

Mussels

A comprehensive mussel survey has not been completed for the refuge; however, a survey was conducted at St. Catherine Creek National Wildlife Refuge, which is located 20 miles to the southeast. This survey indicated the possibility of the following mussels occurring on the refuge: fat pocketbook, mapleleaf, flat floater, paper

pondshell, giant floater, Texas liliput, pond, yellow sandshell, paper-shell, pink papershell, and southern mapleleaf.

Old Growth

Old growth, an extremely important, if not one of the greatest ecological assets of the refuge, is a vanishing native habitat in the Lower Mississippi Valley. This rare hardwood plant community has outstanding ecological value, especially for forest interior breeding songbirds. While there is no formal initiative in place that outlines a specific technical approach for managing the old growth area, the Service will monitor the quality and condition of this site and propose it for Research Natural Area designation. Due to its significance, it will be afforded special protection and will be used as a model for study on which to base management direction of the refuge.

Invasive Species

Also known as exotic or non-native species, invasive species are becoming an increasing concern of refuge staff. Feral hogs and Chinese tallow pose threats to the biological diversity of the refuge. Feral hogs degrade wildlife habitat, and being omnivores, prey on young livestock, as well as fawns and ground nesting birds. Feral hog habitat preferences include moist bottomlands and dense vegetation along rivers and streams. Upland habitats where oak mast is found also attract these scavengers. Feral hogs are prolific reproducers. Control methods commonly used on the refuge to reduce the populations include hunting and trapping. Chinese tallow (*Sapium sebiferum*) is a small- to medium-sized tree that is reported in small numbers on the refuge. The plant is highly invasive and could quickly out-compete native plant species if left unattended.

Habitats

The habitat communities of ridge and swale topography are important for the long term survival of many plant and wildlife species (Figure 8). About 10,600 acres of these forests are within the refuge boundary. The forests, however, exhibit poor canopy, midstory, and understory structures to support populations of priority bird species, including the swallow-tailed kite, Cerulean warbler, Swainson's warbler, and American woodcock. The swallow-tailed kite and Cerulean warbler are extirpated from the refuge, but historical records suggest that the refuge was once included in their breeding range (Cooke 1904, Beyer 1900, Oberholser 1938). Managing to exhibit the features, functions, and processes characteristic of old growth communities may yield the highest benefit for priority bird species.

The refuge was established to protect the exemplary 750-acre old growth forest noted for its outstanding wildlife habitat value. This area supports a variety of sensitive species, including nesting songbirds. Natural communities include bottomland hardwood forests, marsh or herbaceous wetlands, swamps, streams, and lakes/deep-water habitats typical of the ridge and swale topography associated with bottomland hardwood forests in this area (Figure 9).

Figure 8. Habitat communities of ridge and swale topography

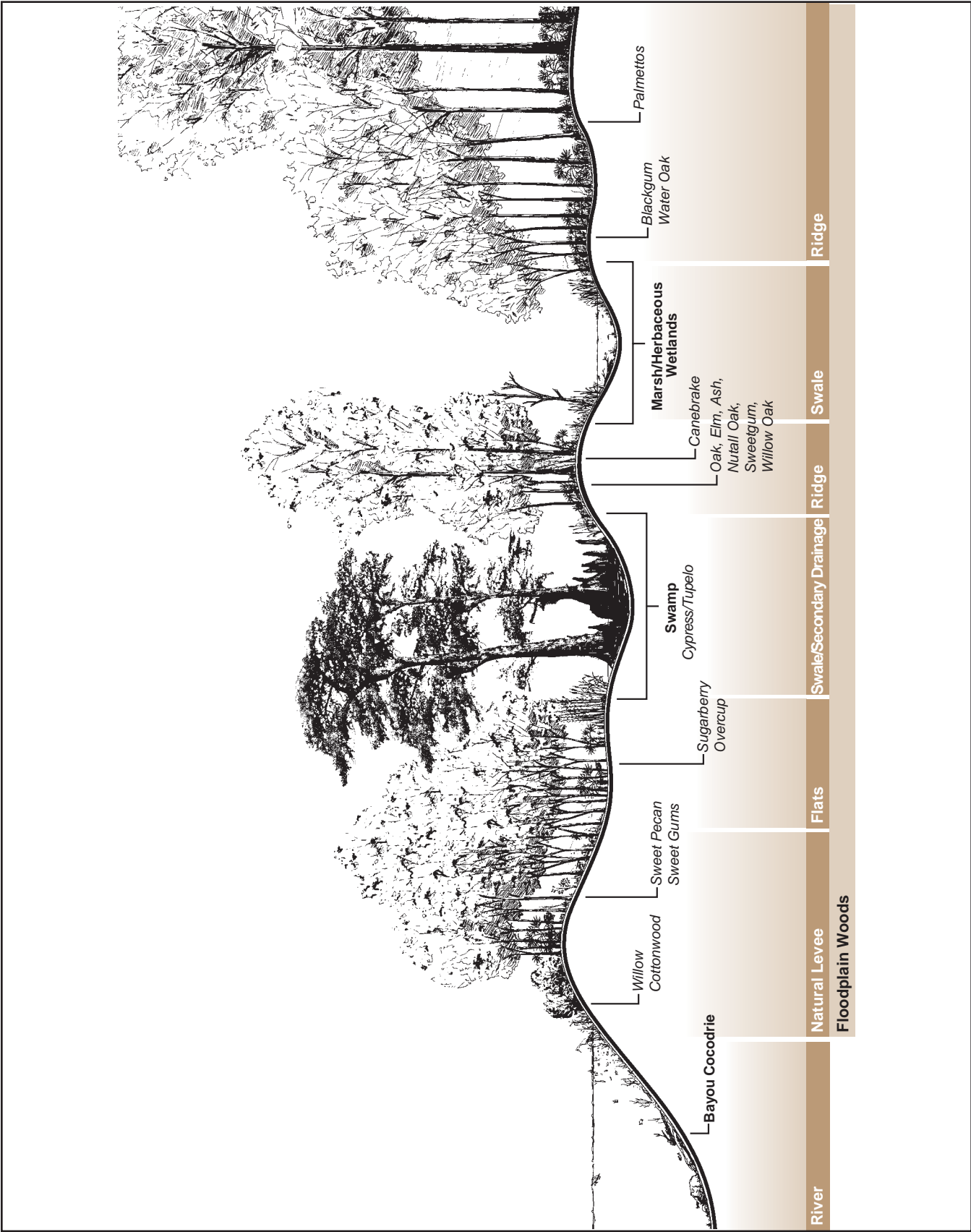
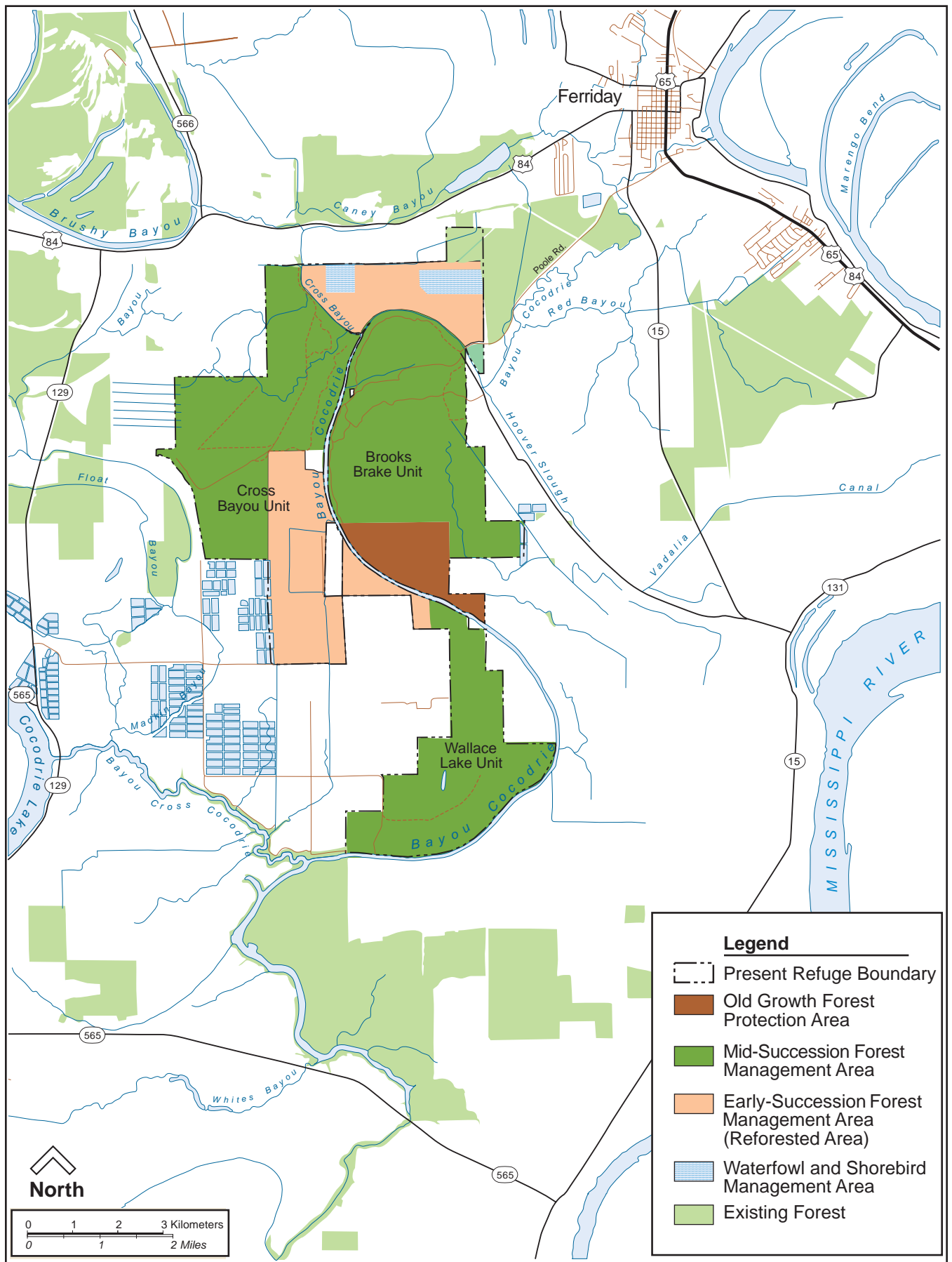


Figure 9. Existing habitat management



Bayou Cocodrie
National Wildlife Refuge

**Comprehensive
Conservation Plan**

Refuge Description



Lofton water control structure
USFWS Photo

Due to the refuge's location, soils, and annual rainfall, which exceeds 60 inches, much of the vegetation consists of bottomland hardwood communities, with the exception of the recently reforested agricultural portions where weeds and grasses predominate.

Forest plant communities differ with slight elevation changes and the understory is reflective of sunlight conditions caused by the canopy closure. Quick to recover from disturbances, soils are fertile with a high site index and fast tree growth. Forest age ranges from very young to relatively old, depending on the site. Trees range in type from red gum, red oak, and sweet pecan on the ridges, to overcup oak, hackberry, and green ash in the flats, to cypress and bitter pecan in the lowest areas. Examples of dominant vegetation include cypress, cottonwood, black willow, sweet pecan, overcup oak, Nuttall oak, winged elm, and Tupelo gum. Sub-dominant plants include palmetto, switchcane, hawthorns, honey locust, and box elder. Other understory plants include smilax, honeysuckle, blackberry, dewberry, and a host of vines including rattan, muscadine, and poison ivy. Wet site vegetation includes pickerel-weed, day flower, water hyacinth, various sedges, and marsh mallow.

The refuge's aquatic habitat includes bayous, creeks, lakes, beaver ponds, and permanent and seasonal swamps. Bayou Cocodrie is a tributary of the Red River, located west of the Mississippi River in east-central Louisiana. Wetlands and deepwater habitat include small lakes, swamps, ponds, and perennial and intermittent streams. Wallace Lake has permanent water. Seasonal floodwater remains in the shallow swales for several months, and in recent years, many of swales in both the Brooks Brake and Wallace Lake units have held water year-round.

Bayou Cocodrie begins at Concordia Lake. This secondary waterway is sluggish due to the flat terrain and management of the downstream weir on Wild Cow Bayou. The backwater flooding is virtually gone because of downstream pumping, resulting in the loss of seasonal flood waters. About 6 miles of this 30-mile river lie within the refuge boundary, and are flanked by natural levees that result in some of the highest ground on the refuge. As it exits the refuge, the bayou flows southward for a distance of 12 miles. Fish habitat diversity is only fair due to the sluggish nature of the stream and the impacts of land use in the watershed.

Old fields where former landowners actively clear-cut and then farmed are scattered along the refuge. Since 1996, managers have been replanting these areas in mixed hardwood seedlings. About 1,100 acres were managed under lease agreements between the refuge and local landowners to produce millet, buckwheat, and perennial grasses for foraging of wintering waterfowl, but these lease agreements have been discontinued. The lands are scheduled for reforestation over the next two planting seasons.

Reforestation efforts will increase the present forest block size and provide direct benefits to many nesting migratory birds and black bear, as well as many other indigenous species.

EDUCATION AND VISITOR SERVICES

Activities oriented toward interaction with and appreciation of wildlife and native habitats are a high priority of the refuge. Wildlife-dependent recreation includes wildlife observation (by hiking and canoeing), hunting, fishing, and photography. Hunting and wildlife observation have been the mainstay of this refuge. Currently, there are no interpretive facilities on the refuge.

Since the passage of National Wildlife Refuge System Improvement Act of 1997, the refuge has adopted hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation as the six priority general public uses. These uses, as such, are management's primary focuses and over time programs will be developed to increase visitor awareness and appreciation of fish and wildlife resources.

The public has yet to discover the natural beauty and wildlife of this refuge. It is largely undeveloped and in 1999 received about 5,500 visitors. The refuge offers hunting and wildlife observation as the primary recreation activities because of lack of facilities and staff to support other programs. Recreation data is limited. The refuge is open during the hunting season with some fishing access allowed at the south end. Public access to the interior of the refuge is limited to a 13-mile trail system located in the Brooks Brake Unit. This area offers the best access from public roads. About 4 miles of trail are open to use by all terrain vehicles for access during the hunting season. A 0.5-mile trail is managed for wheelchair access.

The refuge serves as a location for wildlife dependent recreation uses by keeping valuable wildlife habitats in the public trust. Trails are maintained for hunting access, wildlife observation, photography, and hiking. The staff contributes time to local schools and civic groups when requested, and periodically conducts specialized environmental education programs. Forest tracts on private lands throughout Concordia Parish have added value for hunting although much of the land is leased as hunting clubs.

There are other public lands within commuting distance that offer wildlife dependent recreation experiences. Five national wildlife refuges - Tensas River, Catahoula, Grand Cote, and Lake Ophelia in Louisiana, and St. Catherine Creek south of Natchez, Mississippi - are within a 2-hour drive of Bayou Cocodrie National Wildlife Refuge. Tensas River National Wildlife Refuge offers an ever-expanding interpretive and environmental education program. Catahoula National Wildlife Refuge provides wildlife observation and photography opportunities with its wildlife drive, observation sites, and trails around Catahoula Lake, one of the most popular over-wintering waterfowl sites in the area. Waterfowl hunting and big, small,

and upland game hunting, using various forms of weaponry, are offered on each refuge.

In Concordia Parish, the Red River/Three Rivers State Wildlife Management Area Complex offers hunting and fishing activities. The Bayou Cocodrie is a state designated scenic river (Louisiana Department of Wildlife and Fisheries 1998). In 1998, the state offered a total of 3 days of modern gun deer hunting--2 days were managed for take of either doe or buck, and 1 day was managed for buck only. The state allows for the use of both modern and primitive weapons. In addition to deer hunting, the Red River Wildlife Management Area is also open to waterfowl and small game hunting.

The Louisiana Department of Wildlife and Fisheries and the Army Corps of Engineers manage more than 60,000 acres of public lands in Concordia Parish to support hunting and fishing. Other fishing opportunities are available at nearby national wildlife refuges. Facilities found at these refuges include fishing piers, boat ramps, and bank fishing areas. Some refuges offer universally accessible fishing areas.

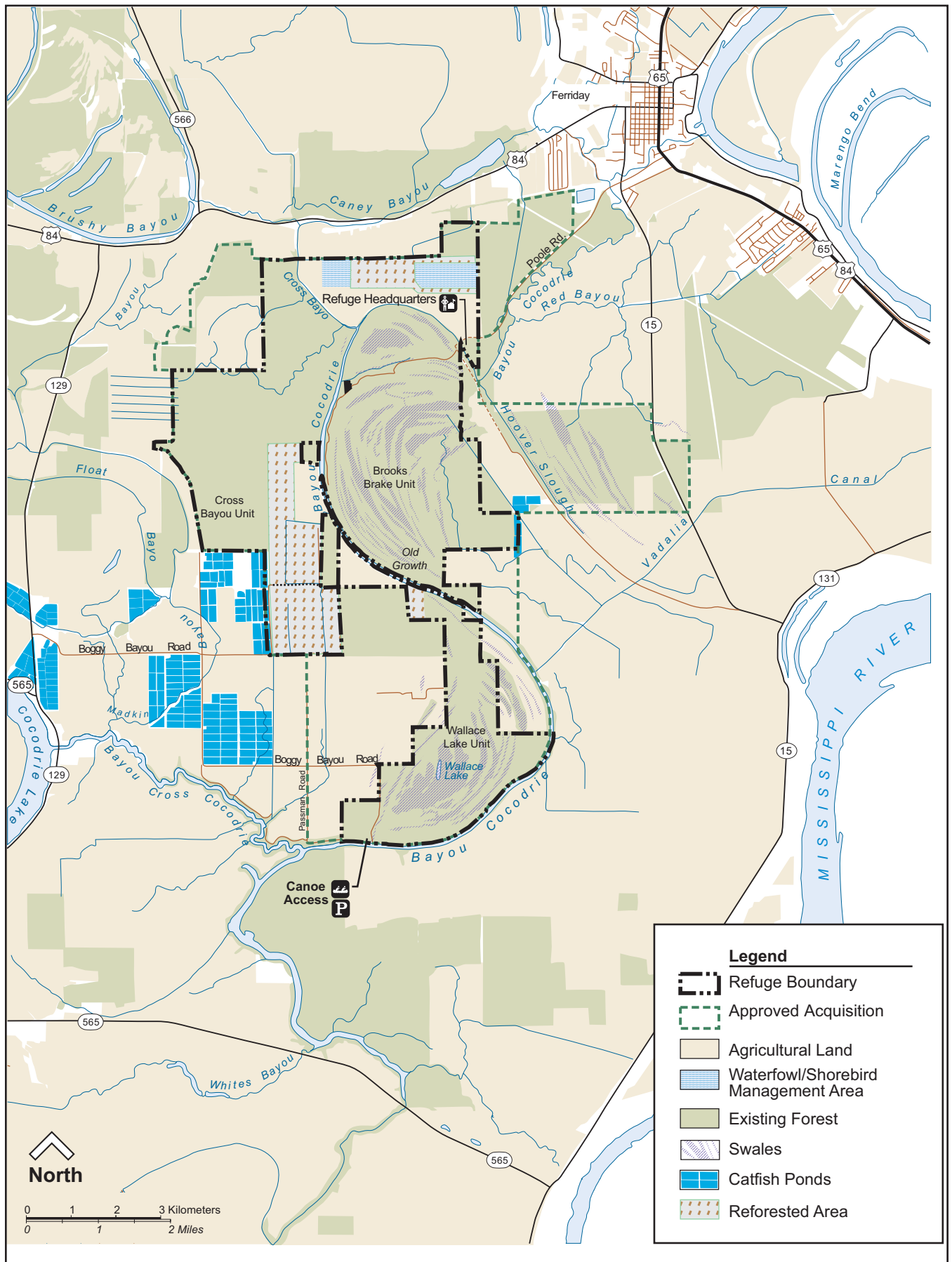
REFUGE ADMINISTRATION

Refuge administration refers to the operation and maintenance of refuge programs and facilities including new construction. The refuge staff consists of six permanent employees. Until 1997, the refuge had two employees and was managed on a custodial basis. The staff coordinates extensively with landowners, conservation organizations, local agencies, and civic groups. The Service is concentrating efforts with the Natural Resources Conservation Service to coordinate land conservation projects on private lands. Of particular interest to the Service is the protection of forested tracts near the refuge boundary that will assist in the long term recovery of the Louisiana black bear.

The staff is focusing efforts on protecting needed lands and developing a systematic approach to manage biological resources. The staff maintains one administrative site, the main headquarters located on Poole Road. The administrative site contains an office, a connecting maintenance shop, and a storage shed for vehicles. The facility has limited space for present staff and lacks a safe fuel storage building. Also lacking are informational/interpretive displays.

Three management units, Cross Bayou, Brooks Brake, and Wallace Lake (Figure 10), are entirely accessed by external roads maintained by the parish and the state. At times, refuge trails are impassable due to localized flooding. Maintenance access is via the same trail system used by visitors. Poole Road, which serves as the main access to the refuge, is primarily gravel and once served as the underlying bed for railroad transport. At times, railroad spikes surface and pose problems for motor vehicle traffic. Boggy Bayou Road is located at the southern terminus of the refuge and terminates next to Bayou Cocodrie. Small boats are launched at the terminus of this road and

Figure 10. Refuge land use features



**Comprehensive
Conservation Plan**

Refuge Description



Brooks Brake unit
USFWS Photo

school buses utilize it for a turnaround. This site is noted as an excellent location to develop a trailhead for boat/canoe launch purposes. Access to the south end of the Brooks Brake Unit is limited and requires permission from the landowner.

The roads and private lands adjoining the refuge have a direct influence on wildlife as they remove habitat in proportion to the areas they occupy. In addition, access provided to wildlife areas has resulted in increased disturbance and poaching in some locations. Several species, including nesting songbirds, avoid roads, trails, and roadside areas thereby reducing availability of habitat (pers. comm., Hunter). Refuge trails are maintained biannually to help provide habitat for birds and other wildlife that utilize edges.

The Federal Highway Administration is planning improvements for Highway 84, the major road to the north of the refuge. The refuge is coordinating the development of these improvements as part of the overall environmental compliance requirements.

RESEARCH NATURAL AREA

Research Natural Areas are designated by federal land management agencies to preserve plant and animal communities in a natural state for research purposes. These areas protect and manage vanishing native habitats that exhibit outstanding ecological value by preventing unnatural encroachments and activities that directly or indirectly modify ecological processes.

House Report 3338-4 describes the need for designating a Research Natural Area as: "In managing the refuge, the Secretary shall manage an amount of refuge woodlands as a contiguous mature forest sufficient to benefit the species of passerine birds that occupy this type of habitat. The Secretary shall give special consideration to accomplishing this objective through the use of his current authority, including his authority to establish Research Natural Areas within the refuge."

A major feature associated with the refuge is the unique old growth site in the south Brooks Brake Unit. When Congress established the refuge in 1990, it directed the Service to protect the old growth area and evaluate it to be managed as a Research Natural Area. This designation is important because the site will serve as a comparison model for scientists to learn more about land management, and to utilize techniques on other sites of the refuge and within the Lower Mississippi Valley. Biologists will gain first-hand knowledge of the values of old growth and coordinate new management approaches to solving habitat issues related to old growth functions.

LAND PROTECTION AND CONSERVATION

Of the total refuge acquisition boundary of 22,269 acres, the Service has acquired 13,168 acres thus far, leaving a balance of 9,101 acres in

private ownership. The acquisition boundary includes a 5,000-acre expansion based on recommendations contained in the Louisiana Black Bear Habitat Protection Plan approved on September 28, 1999.

The refuge staff is focusing on land acquisition within the refuge acquisition boundary by coordinating priorities identified by the Lower Mississippi River Ecosystem Team. Land protection goals set for the refuge will support strategic growth in areas where there is greatest concern, namely lands identified for migratory songbirds and black bears.

The Federal Government does not pay property taxes, but payments are made to local communities to offset taxes on those properties removed from the tax rolls. The refuge is exempt from land-based tax rolls but contributes to the local parish through the use of the Refuge Revenue Sharing Act of 1964. The local government is provided with a share of revenues from refuge receipts in lieu of taxes it normally receives from properties in private ownership. In 1999, Concordia Parish received \$49,813 as its share of these funds.

Private lands in Concordia Parish enrolled in conservation programs contribute significantly to wildlife conservation. The Service has an active partnership with several agencies and organizations to enroll private lands in these programs. Approximately 1,600 acres adjacent to the refuge are enrolled in the Wetlands Reserve Program administered by the Natural Resources Conservation Service. Private land enrollment in conservation programs will continue to be encouraged to augment Service program and mission requirements. Concordia Parish topography is 5 percent lakes, rivers, and bayous; 63 percent cultivated croplands; and 32 percent forests. The topography is characterized by undulating lands or lands locally referred to as ridges and swales. The swales are old river scars. The average ridge elevation fluctuates to about 3 feet in grade and ridge width varies between 120 to 350 feet. The swales or depressions vary from 50 to 300 feet wide. Surface gradient is 1 to 2 percent and drainage is localized. Natural levees along present waterways generally range from 3 to 5 feet.

CONTAMINANTS

Contaminants are not well studied on the refuge. The Service completed site contaminant inspections (Level 1) on properties prior to purchase from 1993 through 1995. A preliminary Environmental Site Assessment of the refuge, prior to Service acquisition, reported that the potential for environmental contamination was low. Beginning in October 1997, the Department of Toxicology of North Carolina State University initiated a study to assess potential biological impacts and hazards resulting from contaminant exposure and the importance of this exposure relative to other biological impacts, such as habitat alteration. The final report is pending. An integrated pest management plan is scheduled to be developed in 2004.

CULTURAL RESOURCES

No detailed archaeological or historical site investigations have been documented for the refuge. The majority of past cultural resource investigations focused along sites at Brushy Bayou, Cross Bayou, and Cocodrie Lake (Ford 1936; Keller and Campbell 1983; Servello 1976; Lower Mississippi Valley Survey 1964; Cusick and McMakin 1994; Cusick et al., 1995; and State of Louisiana Site Files). Many of these investigations focused on the archaeological manifestations of early Native American groups, (i.e., Marksville, Natchez, and Tunica) which have resulted in the identification of several major single mounds and mound groups (16Co9, 16Co14, 16Co15, 16Co80, 16Co92, 16Co99, and 16Co102). Occupations of these sites date from Poverty Point through the Coles Creek Periods [ca. 2000 B.C. 1250 A.D.] (Neuman 1984; Jeter et al., 1989). Cusick and McMakin 1994, and Cusick et al., 1995, recorded several late 19th and early 20th century tenant farm sites and the early 20th century sharecropper community of Frogmore (16Co159). The latter is located on Brushy Bayou just north of the refuge. Frogmore centered around a cotton gin, a store, and a post office. Levee and road construction and agricultural activities have adversely impacted the archaeological deposits associated with many of these sites. However, oral history interviews and documentary research could provide a wealth of information regarding the refuge and the parish

PHYSICAL ENVIRONMENT

The refuge geology is underlain with Pleistocene deposits of the Mississippi River which extend and dip toward the coast. A Pleistocene-age eroded subsurface exists at 50 to 150 feet below the surface, with Tertiary age sedimentary deposits beneath this subsurface (Saucier 1994). Faulting is commonly related to sediment loading and deep-seated salt movement and may provide conduits for potential cross-formation groundwater flow.

Virtually all of the soils are Alligator-Tensas-Dundee-Sharkey-Tunica, and Sharkey-Alligator-Tensas. These soils are clay or loam and have clay or loam subsoils. The soils are fine textured and poorly drained with low permeability. Standing water is common during rainy periods of the year. These soil types are highly restrictive for urban and agricultural uses because of their high shrink-swell characteristics and low-bearing strength.

Hydrology and water management influences the function of habitats on the refuge. Bayou Cocodrie is a meandering tributary of the Red River. Historically, when the Red River reached flood stage, backwater flooding was common within the watershed. Since the development of flood control structures, Bayou Cocodrie's natural overflow is restricted to large flood events. The natural sediment supplies at the refuge are threatened by flood control and agricultural operations, including the operation of the Wild Cow Bayou weir which prevents the natural back flow of floodwaters.

*Bayou Cocodrie
National Wildlife Refuge*

**Comprehensive
Conservation Plan**

Refuge Description



Muzzle loader deer hunter
USFWS Photo

Nearby levees, irrigation channels, and pumps have influenced the change of riparian systems to water development projects in support of agriculture. Natural flooding assists in maintaining healthy bottomland hardwood forest habitat by recharging the forest with sediment and nutrients.

The refuge is within the 582-square-mile Tensas-Concordia Levee area. The levee system borders the Red, Black, and Tensas rivers and was built for flood protection. For the most part, the historic backwater flooding is impeded because of the ring levee and pump systems operated on the Wild Cow Bayou in western Concordia Parish. Bayou Cocodrie functions more like a lake than a free flowing stream due to the weir on Wild Cow Bayou (Corps of Engineers 1990, Soil Conservation Service 1968).

The subtropical climate is characterized by high humidity, an absence of extreme temperatures, and abundant rainfall distributed evenly throughout the year. The climate is controlled by warm, moist air from the Gulf of Mexico, and cooler, drier air from the central plains. Extended hot, sultry summers and moderately cool winters are normal. The summers have about 85 days with highs greater than 90 degrees Fahrenheit. The winters are marked by brief cool periods with average winter highs in the mid-50s. Annual rainfall is 55 inches and the growing season is approximately 220 days in duration. The average annual runoff occurs from December to April. Evaporation exceeds precipitation in the summer.

SOCIAL AND ECONOMIC ENVIRONMENT

The rural character and sparse population are characteristic of east-central Louisiana. Census data from 1990 indicate that the parish had a population of 20,828 people, which is a decline of 9 percent since the 1980 census. The parish seat, Vidalia, had a decline in population from 6,000 in 1980, to some 4,953 in 1990. Ferriday had a 1980 population of 5,500, and a 1990 population of 4,111. Population shifts in Concordia Parish, as a whole, are largely attributable to a decline in the farming, oil, and gas sectors of the economy since the early 1980s.

Per-capita income recorded for Louisiana in 1998 was \$22,206 (USDA, ERS 1998). Overall, Louisiana ranks among the one of the poorest states in the country. Oil and gas production and agriculture have long been the main economic base in Concordia Parish and surrounding areas. Some of the major private employers in Concordia Parish include Wal-Mart, Aluminum Company of America, D&D Petroleum, Rogers Lumber International, Inc., and Ferriday Market. Other major employers include the Concordia Parish Schools, Riverland Medical Center, and Concordia Electric Cooperative (Fish and Wildlife Service et al., 1998 Appraisal Report).

Lands adjacent to the refuge are privately owned and managed for farmland, catfish, and timber. Concordia Parish consists of about 479,000 acres, of which 63 percent is cultivated cropland, and 32 percent is woodland. The surrounding farmland primarily is farmed for

soybean, cotton, corn, and catfish. Scattered forests surrounding the refuge are valued as private hunting clubs. There are approximately 1,050 farms (averaging in size of 586 acres) in Concordia Parish with more than 700 receiving some form of payment from the U.S. Department of Agriculture. Farm commodity prices, in general, have decreased since the mid-1980s and more dramatically since the passage of the 1996 Farm Bill. Poor farm production, drought, and low commodity prices in the last three seasons have encouraged many producers to sell their farms and/or enroll them in some type of conservation program. Income derived from land sales and enrollment in conservation programs (including restoration for waterfowl and black bear habitat) is very important to the local economies (pers. comm., Natural Resources Conservation Service 1999). Due to poor yields in 1998, Concordia Parish claimed the largest conservation reserve program enrollment in the state. In 1999, the Wetlands Reserve Program reported that more than 8,000 acres were enrolled with a total of more than \$5 million invested in Concordia Parish. Within the refuge boundaries, most of the commercially owned timberlands were partially or totally harvested from the 1920s to the 1940s, with final sales recorded in the 1970s and 1980s.

REFUGE RELATED PROBLEMS AND ISSUES

In 1990, Congress established the refuge to protect and restore bottomland hardwood forests for a diversity of wildlife with special emphasis on migratory birds and the Louisiana black bear. To date, 13,168 acres, which make up the refuge, are considered a significant shortfall and insufficient to fully implement the purposes legislated by Congress.

The key biological value of the refuge is the bottomland hardwood forest communities, particularly the rare old growth plant community. Many migratory land birds depend upon these forest habitats for a portion of their life cycle. Of the 186 species of birds and a host of other mammals, reptiles, amphibians, and fish that utilize the refuge, 4 species have been federally listed as either threatened or as species of management concern. The Louisiana black bear has long been a focus of management efforts at Bayou Cocodrie Refuge.

Road development, forest fragmentation, loss of older-aged forests, recreational use, and rural development on lands surrounding the refuge represent the land status trends in Concordia Parish. The surrounding development has led to declining wildlife populations, habitat degradation, wildlife/people conflicts, pesticide accumulation in the water, pest management problems, and a need for increased law enforcement to administer hunting programs.

Many of the refuge's significant resource problems and management challenges are reflected on a larger scale within the Lower Mississippi Valley. These problems, both individually and cumulatively, play a significant role in determining future conditions on the refuge. These problems and challenges are briefly summarized in the following paragraphs.

Forest Fragmentation

The greatest challenge to meeting refuge objectives is forest fragmentation within a landscape scale. Although the refuge is mostly forested, it is considered fragmented because it is within a mostly agricultural landscape. The present configuration and size of the refuge is not sufficient to support or contribute to populations of area sensitive, mature forest birds such as the Swainson's warbler. The refuge must secure and restore additional lands within the current acquisition boundary to form a contiguous forest of sufficient size to meet refuge objectives.

Forest Conditions

Present forest conditions found on the refuge (with the notable exception of the proposed Research Natural Area) are marginal in quality as they relate to being able to support mature forest bird species. Forest stands on the refuge, with the exception noted above, are mid successional and exhibit classic mid-successional forest characteristics such as heavy stocking, closed canopies, and little vertical structure. In order to provide conditions suitable for many mature forest species, the refuge must manage its mid-successional forest stands to provide more structure.

Lack of Inventory Information

The development of baseline data is a task expected to take years for present staff to accomplish. National Wildlife Refuge System policy requires inventories of plants, fish, wildlife, and habitats. Monitoring of critical parameters and trends of selected species and species groups, and the subsequent basing of management on sound data, continue to be a problem due to staffing constraints. No standard inventory and monitoring method has been established. Fish, reptile, and amphibian conservation is overlooked because of the lack of information and funding to manage these resources.

Low Operation and Maintenance Funds

The refuge is faced with the challenge of contributing substantially to off refuge ecosystem objectives, such as migratory bird and game species management. These ever increasing responsibilities, coupled with the current low levels of funding, make it difficult to meet the demand for biological services on and off the refuge. The refuge staff is also facing the challenge of managing an active and increasing visitor services program. The Red River and Three Rivers Wildlife Management Areas, managed by the Louisiana Department of Wildlife and Fisheries, are the only other public hunting and fishing areas in Concordia Parish. The refuge provides hunting opportunities and those opportunities will be expanded as the refuge grows and as additional staff become available. Other recreational opportunities will be provided and expanded as facilities, staff, and funding become available. Access to the refuge, however, is very limited due to terrain conditions and lack of roads and trails.

REFUGE CONSERVATION PRIORITIES

Priorities identified for Bayou Cocodrie National Wildlife Refuge include a stronger management emphasis on migratory songbirds. Focal species are managed according to refuge size and location which contributes to the overall health of the ecosystem. Identified migratory bird and black bear protection areas typically overlay public and private lands. The public land portions of these conservation zones may not contain sufficient amounts or the kind of wildlife habitat (e.g., mature stand structure) to support high priority species. As a result, the Service and partners work collectively with landowners to achieve common goals and form conservation partnerships. One such conservation partnership involves the Natural Resources Conservation Service. Landowner participation in its Wetlands Reserve Program may assist the Fish and Wildlife Service in meeting wildlife objectives through the acquisition and restoration of 1,400 acres directly adjacent to the refuge.

A forest Source Population Objective of roughly 20,000 acres for the refuge and 30,000 acres in nearby private lands is identified to support declining songbird populations that once were abundant in this area. Also, reforestation to remove carbon from the atmosphere on refuges and other lands in the Lower Mississippi Valley is a long-term goal.

The following land birds either currently breed, or have historically bred, on the refuge and are ranked by priority on which to focus management efforts: extremely high priority--swallow tailed kite, Cerulean warbler, and Swainson's warbler; high priority--red headed woodpecker, northern parula, yellow-billed cuckoo, wood thrush, prothonotary warbler, white-eyed vireo, American woodcock, and wood thrush. These species are focal species that are assumed to be sensitive to habitat changes and represent the needs of a larger group of migratory species.

The recovery of the Louisiana black bear includes 5,000 acres of land for an expansion as identified in the Louisiana Black Bear Habitat Protection Plan. These lands are now within the approved acquisition boundary. Additionally, bear corridors have been identified to connect habitat patches and will be targeted for reforestation by the private lands program.

Long-term goals for the Louisiana black bear will be accomplished when there are at least two viable bear populations that have genetic interchange (joining Atchafalaya population with Tensas River population). The black bear protection areas overlay the forest Source Population Objectives from the Tensas River National Wildlife Refuge in Madison and Tensas parishes, Louisiana, to the Bayou Cocodrie National Wildlife Refuge and the Red River Wildlife Management/Three Rivers areas in Concordia Parish, and the Atchafalaya Basin.